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ABSTRACT

This paper provides an overview of the variables critical to the success of an Internet site design. The site under development represents one aspect of dissemination for the Modeling Instruction with Modern Information and Communications Technologies: the MIMIC Project, a U.S. Department of Education Capacity Building Grant. The site focuses on materials useful to the integration of technology into pre-service teacher education programs. Critical to the success of this Internet site is the development environment created to support participant collaboration. This development environment evolved from a variety of approaches established to encourage student and faculty involvement. Assembling the design team is discussed, including the following characteristics of "hot groups": task obsession becomes a state of mind; "we" dominates "I"; the organizational structure is more egalitarian than hierarchical; members do multiple jobs; and the groups are small. The following conditions for an appropriate environment for the design of the Internet site are described: competence; a shared goal; mutual respect, tolerance, and trust; representation; communication; and responsibility. (Contains 12 references.) (MES)

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Design of the MIMIC Network for Preparing Tomorrow's Teachers

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Abstract: This paper provides an overview of the variables critical to the success of an Internet site design. The site under development represents one aspect of dissemination for the Modeling Instruction with Modern Information and Communications Technologies: the MIMIC Project, a U.S. Department of Education Capacity Building Grant. The site focuses on materials useful to the integration of technology into pre-service teacher education programs. Critical to the success of this Internet site is the development environment created to support participant collaboration. This development environment evolved from a variety of approaches established to encourage student and faculty involvement. Two aspects: 1) assembling the design team and 2) defining an appropriate environment for the design of the Internet site are detailed in this narrative.

Despite the growth of the number of computers in K-12 schools, less than 10% of recent graduates of teacher education programs feel competent to use electronic network capabilities (OTA, 1995). The technology instruction provided in teacher preparation programs tends to focus more on older and simpler software applications such as drawing programs or word processing rather than newer sophisticated tools like electronic networks or problem solving applications (Baron & Bruillard, 1994). As Internet access becomes more commonplace, teacher educators will become fluent in using networks much as they have become fluent in using word processors. However, fluency in the use of a technology does not necessarily translate into integration of that technology into teaching.

The Modeling Instruction with Modern Information and Communications: the MIMIC Project, a U.S. Department of Education Capacity Building Grant, is a project initiating inquiry into the issue of technology integration. The MIMIC project was designed to prepare pre-service teachers to integrate technology into teaching and learning. One of the goals of the MIMIC project is to create an on-line community to connect three populations: 1) teacher educators, 2) classroom teachers and 3) preservice teachers with the integration of technology in instruction. The MIMIC project began in the Fall of 1999. This paper focuses on the on-line community component of the MIMIC project and provides an overview of the activities that were considered in the design process of the MIMIC site. Special emphasis is placed on the creation and support of the design team. In particular, attributes of a design team and how design activities relate to creating an environment conducive to the integration of technology by teacher educators play a prominent role in this discussion.

The purpose of the MIMIC site is to provide online resources, project information, and online communications. The site supplies one form of dissemination for the project. The MIMIC site is the product of a collaboration among five institutions of higher education. The MIMIC site was developed by a collaborative team including faculty in educational technology and students enrolled in a Master Degree Program in Computer Uses in Education at Cleveland State University.

Developing the MIMIC site required the efforts of many individuals. Each individual offered specific talents and varying levels of understanding to the development process. Assembling a team of competent individuals was the first step toward successful development. To design a site that encourages use by novices lacking in technological expertise, we used a participatory design approach that involves users in the design

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process. Establishing an appropriate environment is critical for successful design. Minimally this environment must support the goals of the site development while providing structure for the participation of designers and users. (Grudin, 1990)

Attributes of Design Participants - Hot groups

Although teams with the characteristics of dedication, creativity, passion, and high achievement can turn up in academic settings, the conditions must be right for their cultivation. Leavitt and Lipman-Blumen (1995) have named teams with these characteristics as "hot groups". Further they suggest that any group can become a hot group when 1) task obsession becomes a state of mind, 2) "We" dominates "I", 3) the organizational structure is more egalitarian than hierarchical, 4) members do multiple jobs, and 5) the groups are small. These five features served as the organizing criteria for assembling and cultivating a design team for the MIMIC Project Internet site.

Task Obsession

Task obsession is a complex phenomenon. One must first have a comprehensive understanding of the task at hand, the time frame available, and a belief that successful completion of the task alone is the reward. The two authors had a vision of what the Internet site could become but the form for this vision was open. What was required to affix a form to the authors' vision was a working group who shared a passion for seeing this vision come to fruition.

Cleveland State University offers a Master degree in Computer Uses in Education. The majority of students enrolled in this program elect to take comprehensive exams in lieu of a Master's project or thesis. Recognizing that many high quality students in this program had never considered the Master's project as a viable alternative, the authors approached students in three courses. First, a brief synopsis of the grant project was provided students to see if any students were interested in the Internet site design project. Second, ten students who self-selected to attend follow-up meetings on the project were informed 1) that the project would require time and effort well beyond the scope of normal classroom projects, and 2) that the project would extend beyond the Fall semester into the Spring semester. Students were discouraged from applying, if it appeared that they were not willing to commit substantial time out of class. Four students from one course indicated that they were up to the challenge. This group of volunteers was enthusiastic and viewed the task as an opportunity to apply their knowledge and technology skills to a real world problem.

The rationale for emphasizing the workload demands was twofold. First, the authors needed to insure that team members were aware of the scope of the task they were about to undertake. Second, the authors wanted to encourage the students who continued with the project to view themselves differently from the other students enrolled in the course. Although this second point sounds elitist, it is based on examples of successful design teams. For example, in Insanely Great, Levy (1994) documented how the original Macintosh design team viewed itself on a mission, how they were separated from the Apple organization, and how they thought of themselves as a class apart. For further examples see Hot Groups (Leavitt & Lipman-Blumen, 1999). Once the students accepted the design challenge they were informed that they would be entitled to three tuition free credits for participating in the project and that artifacts from the project could be used as partial fulfillment of requirements for a Master's project.

The design team received background information on the Internet project. This background information furnished an overview of the task. In addition, the team received a persona and scenario. Persona and scenario are design devices suggested by Cooper (1999) to add realism and understanding to a design effort. The persona describes a typical user in concrete terms. When one reads a persona it describes a single user not an average user. The scenario describes the typical circumstances and constraints under which this persona uses a design artifact. The purpose of both the persona and scenario is to put a real face on the user. As such, designers know in a more precise manner who they are designing for and as a result are less likely to add features to the design that do not address the specific needs of the user. From the standpoint of task obsession, the persona and scenario helped the design team know the user audience and what the user expected.

"We" Dominates "I"

At the outset the student design team viewed the faculty as project leaders. This was anticipated and it was assumed that initially students would be dependent on faculty input but that over time they would assume responsibility for a particular aspect of the web design and become less dependent on faculty input. To encourage a "we" mindset the design process started slowly. As stated, background information, persona and scenario were distributed. Students also received lists of professional development web sites that offered information related to teacher integration of technology and a diagram categorizing the interests of the intended audience. The new information was used to increase background information and to provide students with a basis for discussing design ideas related to the web site design. After several discussion sessions it became apparent that the students had developed a high level of understanding of project purpose. At this point the students were asked to identify an aspect of the project that they would like to undertake, they were reminded that it was a group effort and that they should expect to work with different team members on other aspects of the project from time to time. At this early writing it is difficult to say with any certainty if the student's will view the design process as a team effort but comments from several students and initial collaborations suggest that movement away from "I" towards "We" has begun.

Organizational Structure

The organizational structure was flat and flexible. It was based on tasks and varied as the tasks changed. Once a task was accepted it became the responsibility of the entire design team to produce a solution. One individual might assume a primary technical function but all members were expected to contribute to the solution. Input from all team members was expected not just encouraged. The size of the group was kept small to facilitate communication among the team and to reduce the potential for the development of a hierarchical structure. Emphasis was placed on the goals of the design rather than job descriptions. Meetings could be scheduled by any designer but most organizational issues were dealt with asynchronously via public email distributions to a design team list and class meetings.

Multiple Jobs

One of the attractions for volunteering for the project was the opportunity to learn new skills. Student and faculty team members were encouraged to pursue tasks that would advance their skill development. Although various levels of graphic, instructional, and technology design expertise were represented in the design team, compartmentalization into an area of expertise was discouraged. In addition, it was made clear that some of the design problems would be tedious and all design team members would be expected to contribute to the resolution of these problems. The condition of multiple jobs led to increased communication across team members from the outset.

Small Groups

Once it became apparent that the design project offered participants with interesting opportunities, and university credit the number of queries into participation increased. No further team members were recruited. Group size remained at six to promote maximum commitment on the part of the design team and for pragmatic reasons such as organizing meetings and maintaining group communication.

Appropriate Environment for Design

Numerous technology design activities have been undertaken in the College of Education at Cleveland State University. (Abate, 1993; Abate & Benghiat 1992; Abate & Hannah, 1993). A ubiquitous feature of these design efforts was the revision process. What this signified was that all products were considered prototypes. As such, they were subject to revision initiated by input from faculty. Faculty input is important. It increases the use of the products developed but revision is time consuming and frequently inefficient. To maintain faculty

participation in projects while decreasing the amount of time spent in revision, the MIMIC project has blended the "hot group" concept with elements of a collaborative design environment.

What constitutes a collaborative design environment and why was this type of environment cultivated for the MIMIC Project? Success in design collaborations is a function of the interaction of many variables. Previously, the decisions employed in assembling a "hot group" were described and emphasis was placed on the variables associated with the design participants. Identifying and cultivating key variables essential to building a collaborative design environment are considered next.

A collaborative design environment encourages development with users. This point highlights a key benefit for the proposed Internet site: the target user is also part of the design team. Faculty who are novice technology users were recruited to serve as site evaluators. In this capacity the faculty were asked to test preliminary versions of the web site. Initial emphasis of their evaluation effort revolved around the value of the content provided in the site and ease with which one could access information. From the outset, the faculty were informed of the expectation to contribute instructional resources to the Internet site. For this project, faculty involvement is crucial but the condition of faculty involvement alone is insufficient to establish a collaborative design environment. Schrage (1989) has identified thirteen conditions common in collaborative design. Several of these conditions are evident in the environment established for the MIMIC project. They are; 1) competence, 2) a shared goal, 3) mutual respect, tolerance, and trust, 4) representation, 5) communication, and 6) responsibility. There is significant overlap among the conditions presented in a productive collaborative design environment and the variables related to the attributes of design participants.

Competence

No individual is competent at all aspects of a complex design effort. When describing the design team for the MIMIC project it was noted that the entire design team was expected to contribute to multiple assignments. In establishing the team, the focus was on sharing responsibility. In establishing the environment, the context changes. The focus now becomes does the team have an adequate level of competence for all aspects of the web design project. Based on the initial efforts and the designers' qualifications it appears that competence will not be an issue.

Shared, Understood Goal

The goal of the MIMIC project web site was not collaborative design. The collaborations among designers were subordinate to achieving the end goal of an Internet site useful to teacher educators. The environment condition of a shared, understood goal was, however, a prerequisite to the participant attribute of task obsession. Task obsession was dependent on the anticipation of an outcome. Time was a critical factor in goal clarification. It took time for all to understand the goal of the design activity. Therefore, time committed at the start of a project for goal definition was time saved in development effort and revision. Lastly, projects with a clear goal progress more quickly than projects with an ill-defined goal. As such, considerable time and effort were expended in the seminal stages of the project to define the goals of the MIMIC web site. An understanding that surfaced from this goal definition phase was that it was impossible to know in advance all the potential problems that might arise during design. The conclusion was that goals might be revised. Periodic reflection on the goals was incorporated into the design process.

Mutual Respect, Tolerance and Trust

3M is a corporation that has distinguished itself as product design leader. Peters has suggested that innovation at 3M is attributable in part from fact that employees take the trust placed in them by management to produce seriously and that management does not violate this trust with an intrusive organization (Nayak & Ketteringham, 1997). As stated previously, the MIMIC design team was free of organizational constraints. Mutual respect, tolerance and trust were fostered by an open non-judgmental atmosphere of cooperation. In the MIMIC project mutual respect was viewed differently from friendship. Friendship is built on familiarity. Respect is built upon action. For example, the design team discussed ideas and individuals presented their work

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at open meetings. The work presented substantiated the designer's commitment to the project. The work submitted led to peer respect.

Tolerance among team members was promoted indirectly. All members of the team had been informed that the design activity was also a learning experience. So, although expectations for effort were high, expectations for expertise were not. Individual designers understood that the team would learn together and that mistakes were inevitable. Trust was a difficult element to address. The design team view on trust was based on the adage "we sink or swim together". Trust was built on the knowledge that each individual's success is dependent on the contributions of all members of the team. Mutual respect, trust, and tolerance were cultivated slowly. These three elements were as complicated an undertaking as the design of the Internet site.

Representation

Recognizing that representations are constructed, the MIMIC Project used a variety of methods to increase the groups understanding of the task. E-mail, written documentation, and verbal discussions were shared to assure that the designer's individual perspective translated into a singe representation. Documentation provided reference points and these points were essential for understanding among a diverse group of designers. Team members were encouraged to represent their ideas in a variety of media both traditional and computer based. Although the form of representation changed, the goal of providing a shared understanding for the other designers remained constant.

Communication

Formal and informal methods were supported for increasing the communication among MIMIC designers. Flexibility, spontaneity, and record keeping were encouraged. Channels of communication varied and the level of communication fluctuated but the design team understood the value of communication. At a recent meeting, one individual served as a translator between the graphic designers and the technical experts during a discussion of site layout. In this instance, the level of communication was open to the entire team and the level of controversy was high. As a result of this discussion, all team members had a clearer idea of how technical issues and graphics design interacted.

Responsibility

It was noted in the section on attributes of participants that each designer provided specific talents to the design collaboration, and that each designer took responsibility for a particular area of interest. There were, however, no job descriptions or divisions of labor. The MIMIC view of responsibility was that designers had clear lines of responsibility within their area of expertise but that they were not restricted to predetermined boundaries based on their area of expertise. Accountability was placed on the completion of the end goal, indicating that responsibility was to the project not to a particular assignment.

Summary

During the initial phase of the MIMIC web site design, emphasis was placed on determining the variables that increase the likelihood of design success. Two variables, 1) the design participants and 2) the design environment were analyzed and the key attributes of these variables were identified. Interestingly, there was substantial overlap of attributes between the two variables. This overlap of attributes outlined much of what needed to be considered in the development of a design team and provided guide points for determining how to start the design process.

A design team based on the key attributes of design participants and design environment initiated web site development. Background information was collected, design specifications developed, research on prior efforts conducted and prototypes developed. It is early in the site development process to conclude whether the "hot group" and design environment described above will succeed in producing an Internet site useful to teacher

educators. However, a functional design team is in place and development is underway. Ultimately, substantial design work must be completed before the Internet site becomes serviceable but when compared with prior efforts with technology developments (Abate et al. 1996) the MIMIC design team appears better organized, focused and committed.

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